Claims

1. Functional element (10; 110) for attachment to a sheet metal part, such as for example a nut element (10) or a bolt element (110) having a body part (12; 112) or head part respectively which has at its first axial end, if required, a circularly cylindrical part (14; 114) and which merges at its other axial end into a cylindrical rivet section (20; 120), characterized in that
the body part (12; 112) is provided in the region between the first axial end, or any circularly cylindrically part provided there, and the rivet section (20; 120) with an at least substantially conical region (16; 116) which forms a contact surface for a corresponding conical region (42; 142) of a sheet metal part (40; 140) and in that the circularly cylindrical part, if present, has a diameter at the boundary (34; 134) to the conical region which is not larger than the maximum diameter of the conical region.

2. Functional element in accordance with claim 1,
characterized in that
features (38; 138) providing security against rotation are provided in the region of the conical surface (16; 116).

3. Functional element in accordance with any one of the preceding claims,
characterized in that
the axial length of the conical surface (16; 116) of the conical region corresponds at least approximately to twice the sheet metal thickness and preferably to approximately four times the sheet metal thickness.

4. Functional element in accordance with any one of the preceding claims,
characterized in that
the enclosed cone angle (α) of the conical surface of the conical region lies in the range between 60° and 150°, preferably in the range between 70° and 140° and in particular between 75° and 115° and amounts particularly preferably to about 90°.

5. Functional element in accordance with any one of the preceding claims,
characterized in that
the conical surface (16; 116) of the conical region merges via a cylindrical neck part (18; 118) into the rivet section (20; 120).

6. Functional element in accordance with claim 5,
characterized in that
the neck part (18; 118) has an axial length which corresponds at least approximately to the sheet metal thickness and is preferably somewhat larger than this.

7. Functional element in accordance with any one of the claims 2 to 6,
characterized in that
the features (38; 138) providing security against rotation have the form of noses which are provided at the conical surface (16; 116).

8. Functional element in accordance with claim 7,
characterized in that
the noses (38; 138) providing security against rotation extend in axial planes.

9. Functional element in accordance with claim 7 or claim 8, characterized in that
the noses (38; 138) providing security against rotation extend at the conical surface over at least substantially the axial length of the conical region.

10. Functional element in accordance with claim 7, characterized in that
the features providing security against rotation have the form of recesses provided in the conical surface.

11. Functional element in accordance with claim 10, characterized in that
the recesses forming the features providing security against rotation are arranged in axial planes of the functional element.

12. Functional element in accordance with any one of the preceding claims, characterized in that
the end face of the body part at its first axial end, i.e. at the end of the body part remote from the rivet section, or at the end face of any circularly cylindrical part (14; 114) provided there, forms a support surface for a component which is secured by means of the functional element (10; 110) to the sheet metal part (40; 140).

13. Functional element in accordance with claim 12, characterized in that
the axial thickness of the circularly cylindrical part (14) is selected in order to realize a spacer function between the sheet metal part (40)

and a component attached to the sheet metal part by means of the functional element (10).

14. Functional element in accordance with any one of the preceding claims,
characterized in that
it is a nut element (10) in which the body part (12) is provided with a central bore (26).

15. Functional element in accordance with any one of the preceding claims 1 to 13,
characterized in that
it is a bolt element (110) with a shaft part (113) which is arranged at the side of the body part (112) of the circularly cylindrical part (114) remote from the rivet section (120).

16. Functional element in accordance with any one of the preceding claims,
characterized in that
a plurality of noses providing security against rotation are provided at the conical region of the functional element, preferably extend over the full length of the conical region in axial planes and are preferably uniformly distributed around the longitudinal axis of the functional element.

17. Component assembly comprising a functional element such as a nut element (10) or bolt element (110), in particularly in accordance with one of the claims 1 to 6 having a body part (12; 112) or a head part which has at its first axial end, if required, a circularly cylindrical

part (14; 114) and which merges at its other axial end into a cylindrical rivet section (20; 120),
characterized in that
the body part (12; 112) is provided in the region between the first axial end, or any circularly cylindrically part provided there, and the rivet section (20; 120) with an at least substantially conical region (16; 116) which forms a contact surface for a corresponding conical region (42; 142) of the sheet metal part (40; 140) and in that the circularly cylindrical part, if present, has a diameter at the boundary to the conical region which is not larger than the maximum diameter of the conical region, wherein a conical region (42; 142) of the sheet metal part is trapped in a ring bead (50; 150) formed from the rivet section and in that the conical region (42; 142) of the sheet metal part contacts the conical region of the functional element at least substantially over its full area.

18. Component assembly in accordance with claim 17,
characterized in that
features (38; 138) providing security against rotation are provided in the region of the conical surface of the functional element and in that the sheet material of the sheet metal part (40; 140) in the conical region (42; 142) engages in form-fitted manner with the features providing security against rotation.

19. Component assembly in accordance with claim 17 or 18,
characterized in that
the axial length of the conical surface (16; 116) corresponds at least approximately to twice the sheet metal thickness and preferably to at least four times the sheet metal thickness.

20. Component assembly in accordance with any one of the preceding claims 17 to 19,
characterized in that
the included cone angle (α) of the conical surface (16; 116) lies in the range between 60° and 150°, preferably in the range between 70° and 140° and in particular between 75° and 115° and particularly preferably amounts to approximately 90°.

21. Component assembly in accordance with any one of the preceding claims 17 to 20,
characterized in that
the conical surface (16; 116) merges via an at least substantially cylindrically neck part (18; 118) into the rivet section (20; 120).

22. Component assembly in accordance with claim 21,
characterized in that
the neck part (20; 120) has an axial length which corresponds at least approximately to the sheet metal thickness and is preferably somewhat larger than this.

23. Component assembly in accordance with any one of the preceding claims 17 to 22,
characterized in that
it is a nut element (10) in which the body part (12) is provided with a central bore (26).

24. Component assembly in accordance with any one of the claims 17 to 23,
characterized in that

the ring bead (50) is formed by displacement of material of the rivet section (20).

25. Component assembly in accordance with any one of the claims 17 to 23,
characterized in that
the rivet section (120) is beaded over around the edge (148) of the opening (144) of the conical region (142) of the sheet metal part (140) to form the ring bead or a rivet bead.

26. Component assembly in accordance with any one of the claims 17 to 22 or 24 or 25,
characterized in that
the functional element is a bolt element which has a shaft part (113) having a thread which projects away from the end of the conical region of the body part (112) remote from the rivet bead or from any circularly cylindrical part (112) present there or from a projection provided at an end of the conical region of the body part (114) remote from the rivet bead or at the free end of a circular cylindrical part provided there.

27. Component assembly in accordance with claim 26,
characterized in that
a nut element is screwed onto the thread of the shaft part and has a radially extending flange which has, at its end face remote from the rivet bead, an engagement surface for a screwing tool and, around this, a ring-like surface for a plunger of a setting head and, at its end face (160) confronting the end face (139) of the bolt element, or at the free end of a circularly cylindrical part (114) provided there, contacts

the end face (139) and is preferably dimensioned in diameter to be larger than this end face (139), i.e. overlaps it.

28. Component assembly in accordance with claim 26 or 27, characterized in that
the projection has a peripheral shape which serves as a projection providing security against rotation for a cable shoe.

29. Component assembly in accordance with any one of the claims 26 to 28,
characterized in that
a cable shoe is located between the nut element (162) and the bolt element.

30. Component assembly in accordance with any one of the claims 26 to 28,
characterized in that
it is provided with a protective coating, not however in regions of the nut element and the bolt element which contact one another.

31. Component assembly in accordance with any one of the claims 17 to 30,
characterized in that
the conical region (16; 116) of the functional element (10; 110) extends over at least substantially the full sheet metal region (42; 142) which is in contact with the functional element after riveting of the functional element to the sheet metal part.

32. Method for the attachment of a functional element in accordance with any one of the claims 1 to 16 to a sheet metal part (40; 140) or for the

manufacture of a component assembly in accordance with any one of the claims 17 to 31,
characterized in that
a conical recess (42; 142) is manufactured in a sheet metal part (40; 140) the cone angle (α) of which corresponds at least substantially to the cone angle (α) of the conical surface (16; 116) of the functional element, with a hole (44) being provided in and concentric to the conical recess (42; 142) with the diameter of the hole corresponding at least substantially to the diameter of the rivet section (20; 120) of the functional element or being somewhat larger than this; in that the rivet section (20; 120) of the functional element (10; 110) is passed through the hole (44) of the conical recess (42; 142) of the sheet metal part so that the conical region of the conical recess (42; 142) enters approximately into contact with the conical surface (16; 116) of the functional element and in that a rivet bead (50; 150) is formed of material of the rivet section (20; 120) which clampingly receives the smaller end of the conical region of the sheet metal part.

33. Method in accordance with claim 32,
characterized in that
the formation of the ring bead (50) takes place by displacement of a region of the rivet section (20) of the functional element (10) and in that the sheet metal material of the sheet metal part (40) is supporting during this displacement in a die which brings the sheet metal material in the conical region into engagement with features of the functional element providing security against rotation.

34. Method in accordance with claim 32,
characterized in that

the ring bead (150) is formed by beading over the rivet section (120) and in that the sheet metal material is supported in a die during or after the beading over which brings the sheet metal material in the conical region (140) into engagement with features of the functional element providing security against rotation.

35. Method in accordance with claim 32,
characterized in that
for the formation of the conical recess in the sheet metal part the sheet metal parts supported on the die is pierced by the free end of the cylindrical rivet section (120) of the element and is formed into a conical recess in a correspondingly shaped cut-out of the die.

36. Method in accordance with claim 35,
characterized in that
for the formation of the stamped slug (161) and of the rivet bead (150) pressure is exerted on a ring-like pressure surface at the free end face of a flange part (164) of a nut element (162) screwed onto the bolt (110).